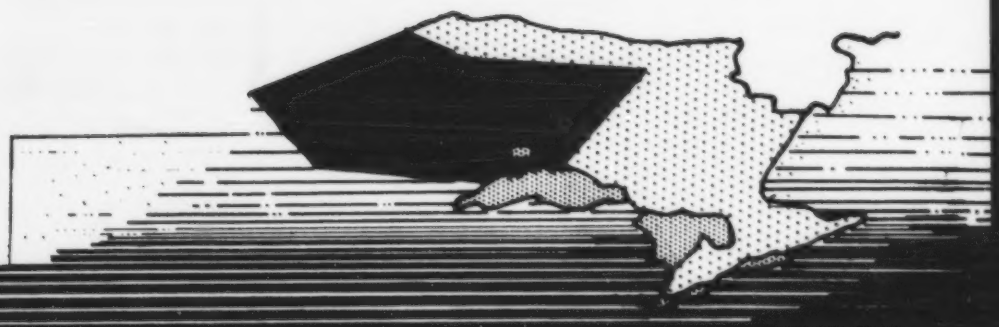

Ministry of Natural Resources
Ontario

NORTHWESTERN ONTARIO FOREST TECHNOLOGY DEVELOPMENT UNIT

A PRE-CUT SURVEY METHOD
INCORPORATING THE
NORTHWESTERN ONTARIO
FOREST ECOSYSTEM CLASSIFICATION

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A PRE-CUT SURVEY METHOD INCORPORATING THE NORTHWESTERN ONTARIO FOREST ECOSYSTEM CLASSIFICATION

BY

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Northwestern Ontario Forest
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TABLE OF CONTENTS

Acknowledgements

Introduction 1

STEP 1 Before You Begin the Process 4

STEP 2 Organize the Work to be Done 5

STEP 3 Off to the Field 7

STEP 4 Completing the Tally Card 8

4.1 Stand Number/Stratum 11
4.2 Management Unit 11
4.3 Area (ha) 11
4.4 Date of Survey 11
4.5 Vegetation or "V" Type - Forest Ecosystem Classification . . . 11
4.6 Soil or 'S' Type - Forest Ecosystem Classification 12
4.7 Stand Composition/Stocking 12
4.8 Stand Composition - Method of Determination 13
4.9 Stocking - Method of Determination 13
4.10 Working Group Species 14
4.11 Average Diameter 14
4.12 Range in Diameter 14
4.13 Product Estimation 14
4.14 Secondary Species 15
4.15 Understorey and Woody Shrub Vegetation 15
4.16 Stand Condition 15
4.17 Terrain 15
4.18 Stoniness 16
4.19 Rock Outcrops 16
4.20 Moisture Regime 17
4.21 Drainage Class 17
4.22 Basal Area Factor 18
4.23 Total of Species Dot Tally from Prism Sweep 18
4.24 Number of Prism Sweeps Taken at the Station Point 18
4.25 Recommended Season of Operation 18
4.26 Residuals Expected After Harvest 19
4.27 Distance to an All-Weather Road 19
4.28 Comments 19

STEP 5 Pulling the Information Together 19

Benefits of Incorporating the Northwestern Ontario Forest Ecosystem Classification into Pre-cut Survey 21

Drawbacks to Integrating the Forest Ecosystem Classification Into Pre-cut Surveys 21

Summary 22

References 23

Appendix I - Materials and Equipment 24

Appendix II - Thunder Bay Field Trial 25

FIGURES

Figure 1a: Pre-cut survey tally sheet, Thunder Bay District 9

Figure 1b: Pre-cut survey tally sheet (back) 10

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A PRE-CUT SURVEY METHOD INCORPORATING THE NORTHWESTERN ONTARIO FOREST ECOSYSTEM CLASSIFICATION

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INTRODUCTION

Planning for forest access, harvest, renewal and maintenance activities is often challenging because of the number of factors which must be addressed or considered during the process. The natural complexity of the boreal forest and the associated site conditions of Northwestern Ontario are two aspects which often make the task more difficult. In order to achieve a plan which accurately reflects the management 'potential' of the resource current, reliable site information is often required. This information also needs to be at a scale complimentary to the level of management being contemplated.

Likewise the day to day renewal of the timber resource can benefit from pre-cut (pre-harvest) site information. Pre-cut survey information facilitates the preparation of operational prescriptions for allocated areas on a site-specific basis (Section 2.4.7.6, Timber Management Planning Manual for Crown Lands in Ontario, 1986). The silvicultural system(s) to be employed in each working group or forest unit will have been previously established, and potential methods of carrying out each of the component activities of timber management for each silvicultural system will have been identified (Section

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2.4.2 and Table 4.11, Timber Management Planning Manual for Crown Lands in Ontario, 1986). The challenge has always been to know where the various site conditions occur and how much of each condition exists within the allocation! Benefits to adopting this approach are many and include:

(a) creating those conditions on the harvested area that preserve inherent site productivity and which permit the establishment of a new forest stand best suited to the site for both volume and value production;

(b) creating those conditions which protect, or preserve the opportunity to manage for other uses;

(c) raising the overall level of forest management by building upon documented results of differing timber management practices that are referenced to an ecological framework;

(d) improving silvicultural prescriptions (Table 4.11, Timber Management Planning Manual for Crown Lands in Ontario, 1986);

(e) reducing access and harvest costs as a result of more efficiently planned layouts and recognizing soil/site limitations to trafficability, road construction, seasons of harvest etc.;

(f) recognizing, protecting and taking advantage of natural regeneration opportunities on certain sites as a means of augmenting artificial regeneration practices and securing a balanced renewal program. Section 4.2, British Columbia Ministry of Forests Silviculture Manual, 1987).

Possibly the best advantage to pre-cut inspections or surveys for management plan or Annual Work Schedule (AWS) preparation is that it allows the forester time to evaluate alternatives and then make a best choice based on a

detailed analysis of economic benefits and costs. Too often operations are prescribed without justification because too little time was taken to fully consider the options and potential costs. Finally compiling pre-cut records provides written documentation of soil/site/stand conditions which may influence silvicultural decisions.

We have designed---and present here--- a pre-cut survey technique which uses the Northwestern Ontario Forest Ecosystem Classification for describing the soil, site and stand conditions of allocated stands. The Forest Ecosystem Classification system (Sims et al. 1987) permits you to classify and describe 38 Vegetation Types ('V'-types or stand cover conditions), 12 deep (>1 metre) and 9 shallow (<1 metre) Soil Types ('S' Types).

The sampling intensity is consistent with mapping at a scale of 1:15,840 - 1:20,000 and is considered a Level 2 Forest Land Survey (Valentine 1986). This survey intensity level (SIL) 2 approach requires a minimum of 1 inspection point per 10 hectares. This translates to 1 station point every 300 metres (15 chains). A minimum of 2 plots in small unique stands is required to ensure documentation of the condition. Under this sampling intensity the ecosystem classification information is summarized on a single tally sheet per plot. This information must then be summarized for the allocated stand. It is important to be aware that other pre-cut assessment methods incorporating operational cruising or volume/cruise data verification have been prepared and will be presented in subsequent reports.

Our pre-cut survey technique comprises 5 basic steps each of which addresses a unique aspect of the information gathering approach. Each of these steps should be reviewed annually to take into account the existence of

additional information which you may also wish to use (eg. operational cruising summaries (OPC), soil surveys and maps, larger scale surficial geology maps).

STEP 1 BEFORE YOU BEGIN THE PROCESS...

1. Carefully identify the allocated stands which require pre-cut survey. Sampling efficiency and therefore cost per hectare is impacted if the stands are scattered across the management area.

   If the purpose of the survey is the preparation of an Annual Work Schedule and accompanying budget you may have no alternative but to sample widely distributed stands. If, however, you are surveying potential or actual allocated stands as a leadup to the management plan you will have a number of 'blocks' of stands which can be priorized for survey.

   Surveying all allocated stands for the next five year period allows you to achieve greater efficiency in the use of your manpower and should result in lower unit costs.

2. Identify, locate and assemble all pertinent resource information. This should include: (a) most recent FRI coverage, (b) FRI 1:15,840 photos with stand boundaries, (c) soil survey maps and documents (if any), (d) surficial geology maps (eg. Northern Ontario Engineering and Geological Terrain Survey - NOEGTS), (e) stand summaries of operational cruising information (OPC), (f) existing and proposed access corridors, (g) any supplementary photography.

This background material will enable partial completion of the field tally forms in the office and will also focus more clearly the data still to be collected in the field.

STEP 2 ORGANIZE THE WORK TO BE DONE...

1. Collect and pre-type if necessary aerial photographs (1:8,000 or 1:15,840 or 1:20,000) defining the possible F.R.I. stand boundaries.

2. Prepare a separate file for eacn allocation containing a copy of the 1:15,840 F.R.I. map with the stand outlined in red ink, a copy of the volume summary from any previous operational cruising (if available) and any specific information related to the specific stand.

   The file folder should be labelled according to:

   (a) Management Unit
   (b) Township/Basemap
   (c) Stand number and F.R.I. stand composition
   (d) Licensee
   (e) Area in hectares scheduled for harvest
   (f) Year of proposed harvest

3. Allocations are then outlined on the most recent aerial photography available, and examined stereoscopically. Larger scale supplementary photography (1:8,000) taken since the last F.R.I. inventory should be used whenever possible.

In some instances where the terrain is complex or when the allocated stand is very large and variable (>50 ha), it may be necessary to stratify the original F.R.I. inventory polygon prior to sampling. Stratification helps to minimize large scale systematic variation and improve the accuracy of the sampling program while reducing the sampling intensity. A polygon size of 8 hectares is recommended as the smallest inventory unit. Stratification should be based primarily on differences in topography and/or species variance and/or crown closure.

4. The sampling design is normally referred to as a free survey. The selection of station points along pre-determined transects is purposive (eg. we wish to sample within each polygon at least once to achieve even distribution and adequate representation of the condition). The following sampling frequencies are recommended based upon a field trial on the Port Arthur Crown Management Unit, Thunder Bay District during 1987:

8-25 ha	1 plot
26-75 ha	2 plots
76+ha	3 plots

Subjective starting points for the transects are permissible given the variability in access availability for allocated stands.Cruise lines and station points are then plotted on acetate overlays using an indelible fine-tipped felt marker. The bearing and chaining distance to each station point should be marked directly upon the photograph if possible or on the acetate. Finally a tally sheet for each station point is created.

Alignment of the acetate on the photograph under field conditions can be made easier if each station point is pin-pricked and the transect number and station point identification number marked on the back of the photographs.

5. Administrative information must then be transferred to tally cards (Figure 1a,1b). The tally cards for each of the station points should then be filed by allocation in their respective folders in preparation for field work.

6. Considerable time can be wasted if the field staff are not equipped with the proper field equipment.All equipment, materials, and supplies necessary to conduct the survey must be gathered prior to going into the field. (Appendix 1)

STEP 3 OFF TO THE FIELD...

1. In the field complete the transects and the tally cards for each station point (Figure 1a,1b). While travelling between plots, the surveyor should be noting on the acetate or tally card any significant changes in stand /site conditions, and stand quality. Additional comments regarding access locations, availability of road-building materials and topographic constraints to operations can be noted on the reverse of the tally card (Figure 1b). Evidence of wildlife activity in the allocated area or potential Areas of Concern should also be documented on the tally card.

Why should we do this? If the stand or site conditions observed on the ground are different from that observed during the pre-stratification, the

surveyor may decide to change the station point locations to achieve a more accurate description of the variability within the stratum.

2. (a) Plot location. The chained location of the station point should be considered to be the centre of the plot. Surveyors must ensure that the plot is representative of the surrounding stand conditions. It is permissible to move the plot centre if the area is not representative of the overall stand condition or what the surveyor perceives to be a major sub-strata of the stand.

(b) Plot size and shape. The basic unit of measurement for assigning a 'V'-type to the station point is a 10 m by 10 m (100 sq m) sample plot. The plot can be physically laid out with ropes or markers or it can be roughly paced out and its area estimated.

Since a portion of the information to be collected is the mensurational description of the stand, the chained location of the station point should also be used as the location for the prism sweep.

STEP 4 COMPLETING THE TALLY CARD...

A number of data elements must be determined and entered on the tally card (Figure 1a,1b).

Pre-Cut Survey

ADMIN

Basemap/Township	Stand No./Stratum 1
Management Unit 2	Area 3
Date 4	Surveyors

FEC

Vegetation 5	Soil 6

STAND DESCRIPTION

So. Comp. FRI 7				Ocular ☐ CPC ☐ 8
Stocking FRI				Sweep ☐ Crown Density ☐ 9
Species	10	14		Stand Condition (Disease, insects, blowdown, form, vigour)
Age				
Ht				16
DBH avg-r.	11 / 12			
Veneer %S. Log Pulp	13			
Understory + Veg. 15				

PHYSICAL ASPECTS

Terrain 17			
Stoniness	18	Rock Outcrops	19
Moisture	20	Drainage	21

STOCKING

BAF 22

23 | | | | | | | |

No. of Pts 24

FIGURE 1a: Pre-cut survey tally sheet, Thunder Bay District

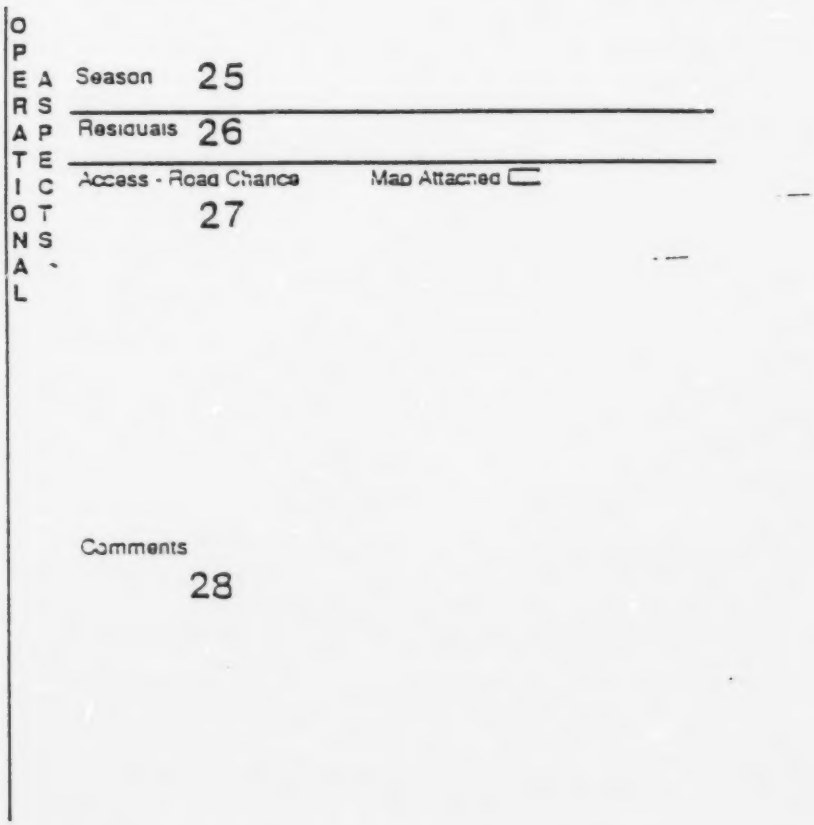

FIGURE 1b: Pre-cut survey tally sheet (back)

4.1 Stand Number/Stratum

Place the Forest Resource Inventory stand number here. If you have stratified the F.R.I. polygon into smaller units, you may wish to label those units as (a), (b), (c) etc.

4.2 Management Unit

Place the name of the management unit, Management Agreement Forest or Working Circle here.

4.3 Area (ha)

Place the gross area of the stand or stratum in this location. In most instances you will be transferring the total area from the F.R.I. 1:15,840 polygon labels.

4.4 Date of Survey

4.5 Vegetation or 'V' Type - Forest Ecosystem Classification

Allocation of the stand is accomplished using the vegetation key contained in the Forest Ecosystem Classification Manual (Sims et al. 1987). You must consider only those species occurring within the defined plot. The initial decision points of the key ask that an assessment of dominance be made for important tree layer species using a percent cover estimate. The finer division points of the key employ decision rules which are based either on presence/absence or percent cover of important understorey species. Refer to Section

2.1.3 of the draft Forest Ecosystem Classification Manual (Sims et al. 1987).

The number of the 'V' type should be placed in this spot. If you feel that you are in a transition zone between two 'V' types then you may wish to note same.

4.6 Soil or 'S' Type - Forest Ecosystem Classification

The basic unit of measurement for the soils key is either an augered hole or an excavated pit to a depth of 100 cm (from mineral soil surface) or to a bedrock contact. This is usually done near the centre of the plot.

In order to assign the soil condition to a particular 'S' type, soil material must be obtained from the C horizon, essentially the unweathered soil parent material.

In order to classify 'S' types, the main parameters which you must know are: depth to bedrock or boulder pavement, texture of the C-horizon material, soil moisture regime, total depth of peat or organic material and the presence of mottles/gley in the profile.

Aids for field description of important soil parameters are provided in Section 7 of the draft Forest Ecosystem Classification manual (Sims et al. 1987) and the Field Manual for Describing Soils, (Ontario Institute of Pedology 1987).

4.7 Stand Composition/Stocking

Stand composition by species' basal area is expressed to the nearest 10 percent following the format used in the Forest Resource

Inventory (OMNR 1978). This can either be estimated visually or determined from a prism sweep.

Stocking of the stand is an expression of the relationship between actual basal area as measured or estimated and normal basal area obtained from Plonski's Normal Yield Tables (OMNR 1978; Plonski 1981). This can either be determined from species' basal area values obtained from a prism sweep on the station point or estimated using a crown density scale (Figure 1b) to estimate crown cover and stocking.

4.8 Stand Composition - Method of Determination

Indicate by checking the appropriate box which method was used to establish stand composition (4.7).

Stand composition determined from previous operational cruising may be entered in the office prior to field work. Often stand composition is estimated through ocular assessment while undertaking a pre-cut survey.

4.9 Stocking - Method of Determination

Indicate by checking the appropriate box which methods were used to establish stocking (4.7).

Stocking may be determined on-site using the results of the prism sweep and comparing the calculated basal area to a normal stand of the same age (Plonski 1981).

4.10 Working Group Species

The working group species (species having the largest percentage of total basal area measured) will be entered in the first column. Standard species designation (ie. Po, S, Bf, Bw etc.) are to be used following the forest inventory standard (OMNR 1978).

The average age for the working group species will then be determined based upon five increment borings taken from dominant trees. This information is to be inserted in the same column listing and immediately below the species' code.

Dominant height of the working group species (metres) will also be estimated using a Sunto clinometer and entered in the appropriate space below 'Age'.

4.11 Average Diameter

The average diameter for the species will be calculated from those trees classified as'in' during the prism sweep. Diameter will be expressed in centimetres.

4.12 Range in Diameter

Place the minimum and maximum diameter tallied for each of the species during the prism sweep in the appropriate column.

4.13 Product Estimation

Estimate the total volume percentage for each species classified as: (a) veneer, (b) sawlog, (c) pulpwood, (d) fuelwood. Criteria for each of the products will vary according to district,

unit, and industry destination. Check with your timber management supervisor for directions on product definition.

4.14 Secondary Species

The same information contained in sections 4.10, 4.11, 4.12, 4.13 will be determined for each of the secondary species within the plot and entered in adjacent columns on the tally card.

4.15 Understorey and Woody Shrub Vegetation

A space has been reserved for the surveyors to make notes summarizing potential competition or operability problems caused by distribution and quantity of understorey or woody shrub vegetation. Problem species should be specifically identified.

4.16 Stand Condition

This space is for comments related to stand condition (eg. evidence of disease, overmaturity, form, vigour, blowdown, insect infestation etc.)

4.17 Terrain

The topography of the site will be identified as: level, rolling, hilly, or broken and steep. Your may wish to add further information on slope class (see Field Manual for Describing Soils, 1987).

4.18 Stoniness

Stoniness of the site must be described since it can limit operability (eg. surface stoniness, rock outcrops) and regeneration treatment options (eg. mechanical site preparation). Stoniness will not be consistent within a stand or strata, therefore you will have to make every attempt to describe the average condition.

Stoniness categories will consist of:

(a) non-stony

(b) slightly stony

(c) moderately stony

(d) very stony

(e) exceedingly stony

(f) excessively stony

(See Field Manual for Describing Soils, 1987).

4.19 Rock Outcrops

The amount of bedrock expression and surface exposure can be described in part by the frequency and extent of rock outcrops. Rock outcrops directly affect operability for harvesting and stand renewal functions and may be used to characterize sites as Protection Forest Reserve.

Rock outcrop categories will consist of:

(a) non rocky

(b) slightly rocky

(c) moderately rocky

(d) very rocky

(e) exceedingly rocky

(f) excessively rocky

(See Field Manual for Describing Soils, 1987).

4.20 Moisture Regime

Soil moisture regime is described on a scale of 0-10 as described in the Field Manual for Describing Soils (1987) and in Section 7 of the Forest Ecosystem Classification Manual (Sims et al. 1987).

A combination of physical soil properties and soil profile characteristics are used to rank the soil moisture regime. Depth to bedrock is a significant influence on moisture regime and is accounted for in a separate moisture regime determination procedure for shallow (<125 cm) soils.

Likewise stratified mineral soils where there is a coarse layer over a fine layer or vice versa have different soil moisture retention capabilities. A separate flowchart for soil moisture regime determination should be used as found in the Field Manual for Describing Soils (1987).

4.21 Drainage Class

Soil drainage classes are based primarily on the internal drainage of the soil, although transmissibility and run-off must be considered. Internal drainage is the quality of a soil that permits

the downward flow of excess water. This is reflected in the frequency and duration of water saturation periods. We determine water saturation from the presence and strength of mottling or gleying in the profile and from the depth at which this evidence of oxidation/reduction occurs.

Drainage is determined according to 7 drainage classes. A key to determining drainage class is presented in the Field Manual for Describing Soils (1987) and is replicated in Section 7 of the Forest Ecosystem Classification Manual (Sims et al. 1987).

4.22 Basal Area Factor

Record the prism BAF used during the survey eg. BAF 2 (metric) or BAF 10 (imperial).

4.23 Total of Species Dot Tally from Prism Sweep

Record the dot tally total for each of the species encountered during the prism sweep. List as follows: Pj/7 Sb/6 Po/3

4.24 Number of Prism Sweeps taken at the Station Point

Record the number of prism sweeps taken at or near the station point which provided the basis for the dot tally in 4.23.

4.25 Recommended Season of Operation

Record as summer, winter or no restriction.

4.26 Residuals Expected after Harvest

Record as: none, scattered, frequent, heavy, patchy.

4.27 Distance to an All-Weather Road

Estimate the distance to an all weather road network.

This section allows you to make comments about:

(a) possible location for creek crossings,

(b) culvert placements and drainage outlets,

(c) erosion potential,

(d) potential engineering constraints eg. steep slopes

(e) existing old logging roads which can be reconstructed.

4.28 Comments

Record wildlife or habitat observations, recommendations on types of harvest and future silvicultural treatments.

STEP 5 PULLING THE INFORMATION TOGETHER...

The entire pre-cut inspection package of maps, annotated photos and acetate overlays and tally cards should be returned to the allocation files established at the outset of the project.

The field information may be summarized in a number of ways depending upon need and availability of staff and funding.

(a) Tally card information can be entered into an electronic data base manager. This would permit sorting of the allocations by ecosystem attributes, operability, merchantable volume, stand quality, access

etc. Placing the tally card data onto a database manager would be beneficial when the survey consisted of more than a single year's allocation (eg. allocation for five year plan). A number of excellent interactive database managers are available including DBASE III plus, QUATRO, FOX BASE. The choice remains with the user.

(b) Annotating a 1:15,840 Forest Resource Inventory basemap with specific information such as 'V'-type, 'S'-type, volumes, updated stand compositions etc. This approach works best with a fewer number of stands e.g. from a single year's allocation. Map annotation is time consuming and costly and may not provide you with the flexibility in accessing the pre-cut information.

Since a single stand allocation may be composed of more than one set of conditions (eg. 'V' or 'S' types) the forester will have to decide how to best annotate the allocation. Since foresters either manage for the dominant or limiting condition, the first approach would be to describe the allocation in terms of the predominant condition. An alternative approach is to 'average' the data and produce a complex polygon attribute label. An example follows: (V6-20/V16-80) / (S4-40/S8-60). The relative occurrence of the conditions among the station points placed within the allocation or strata would form the basis for this description.

Then develop logical operational treatment units in consideration of the annotated basemap or from running sorts of the electronic data. District/company staff, responsible for the management of other resources, should be advised of the process which you are following. This will ensure that all relevant sections are given the opportunity to examine the data and possibly participate in the pre-cut planning process.

BENEFITS OF INCORPORATING THE NORTHWESTERN ONTARIO FOREST ECOSYSTEM CLASSIFICATION INTO A PRE-CUT SURVEY

A number of benefits exist and these include:

a) Facilitating communication of soil/site types and treatment responses through the use of standardized nomenclature for vegetation and soils;

b) Providing a comprehensive overview with respect to vegetation and soil components. This may contribute to more informed prescriptions for engineering, harvesting, silviculture and protection of other values while using the management interpretation information for the ecosystems;

c) FEC typology provides the manager with a clear indication of the existing and potential for wildlife forage and habitat. This would lead to improved management for wildlife habitat and other uses.

DRAWBACKS TO INTEGRATING THE FOREST ECOSYSTEM CLASSIFICATION INTO PRE-CUT SURVEYS

Possible drawbacks to this system include:

(a) Information should be collected during the full-leaf period to ensure that the 'V'-Type is accurately assigned;

(b) Requirement for staff to have previous training and field experience using the Forest Ecosystem Classification. This training should ideally have been obtained through one of the FEC training courses;

(c) Time required at each station point is increased due to the need to collect soils and vegetation information;

(d) Soils data can only be collected from May 24 to October 31 annually for most sites in Northwestern Ontario.

SUMMARY

The procedure described here, and the accompanying forms, have been developed to permit a consistent quality of pre-cut survey data collection and organization throughout Northwestern Ontario and to formalize a process already carried out by many managers. While these procedures provide the basic framework, some managers may wish to modify them for local needs. The collection of the same quantity or quality of data will not be necessary or desirable on every unit assessed since it is recognized that both sites and forest management requirements vary throughout Northwestern Ontario. The forms have been designed with this in mind. Landscape complexity and diversity will ultimately determine the sampling intensity and the type of data collected.

The manager must provide his assessment staff with specific instructions on the detail and intensity of sampling to be undertaken. This will avoid unnecessary effort and collection of complex data. In the final analysis it will be possible to group ecosystem types for management purposes (Treatment Units). A framework for defining Treatment Units will be released shortly as part of the continuing Forest Ecosystem Classification program.

A summary of Thunder Bay District's experience in developing and applying this system is contained in Appendix II.

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APPENDIX I

MATERIALS AND EQUIPMENT

Field Guide to Forest Ecosystem Classification for Northwestern Ontario

Field Guide to the Common Forest Plants of Northwestern Ontario

Munsell Colour Chart with gley pages

Field Guide to Describing Soils (1987)

Tally cards printed on waterproof Kimdura paper

Plastic ruler (20th scale)

Metal clipboard

Clinometer

Diameter tape (metric)

Distance tape (metric) for measuring vegetation plots/ soil depth etc.

Wedge prism (BAF 2)

Increment borer

Pocket stereoscope

Compass

Flagging tape

First aid kit

Dutch soil auger

Small dropper bottle with 10% Hydrochloric Acid

Soil sample twistpak bags (for collecting material to texture on rainy days)

Hip chain

Hip chain thread

APPENDIX II

THUNDER BAY FIELD TRIAL

DESCRIPTION OF PROJECT

Thunder Bay District completed the design of a pre-cut survey method incorporating the Forest Ecosystem Classification system during August 1987. This included design and field testing of a data tally card.

A total of 3000 hectares of allocated stands from the Port Arthur Management Unit's proposed 1988-1989 Annual Work Schedule were identified for pre-cut survey. Of this total some 1700 hectares were surveyed given the money available ($7,500.00 salary/$2,500.00 supply and service).

The field tally card presented in this report represents the final product of three revisions which occurred during the program. It is based, in part, on the Abitibi-Price, Thunder Bay Woodlands, and the Domtar Forest Products pre-cut inspection sheets and on practical input from the Senior Technicians and forester from Thunder Bay District.

OBSERVATIONS AND CONCLUSIONS

Office preparation and organization of the work is critical. Pre-typing photos into strata consumes considerable time and money if the staff assigned to the project are poor photo-interpreters.Nearly 20 percent of the survey crew's time was spent on office related matters. It is recommended that a photo-interpreter be assigned the specific task of plotting cruise lines and selecting station points.

An experienced two person crew carried out this project and averaged 12 plots per field day. After the tally sheet had been refined, time spent at each plot averaged 12 minutes. Although better suited to a two person crew, this survey could be completed by a competent person working alone.

While this production rate does not seem great you must remember that the allocations were scattered across the townships and in very inaccessible locations. Thus as much as 25 percent of the staffs' field time was spent in transit to the site or in accessing the allocated stand. The production rate would improve dramatically with staff staying on location and also when blocks of nearby stands are allocated for survey.

Based on this study and tempered with past cruising operations, the average cost per hectare (including office support and permanent salary overhead) for pre-cut surveys is $7.00/ha.

Persons involved in this type of pre-cut survey should have attended the FEC soils and vegetation courses offered through the Technology Development Unit.

FEC data collected during pre-cut surveys enhances FRI and OPC information thereby enabling forest managers to make better use of their skills in planning the harvest and its regeneration.